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Kinetic Inductance Detectors for X-ray Spectroscopy

The lack of efficient x-ray detectors is often the main factor limiting the effective use of ever more powerful synchrotron light sources. Spectroscopic X-ray detectors are used for a wide variety of synchrotron experiments including X-ray micro/nano-probes and X-ray absorption spectroscopy for biology and geophysical applications. The current state-of-art spectroscopic X-ray detectors are semiconductor devices, and their energy resolutions are approaching their theoretical limit of about 100eV at 6 keV. We describe a detector research and development program to develop the next-generation of high-resolution spectroscopic X-ray detectors using superconducting Microwave Kinetic Inductance Detectors (MKIDs). With a required energy per charge carrier four orders of magnitude smaller than that of Si, superconducting detectors offer two orders of magnitude increase in energy resolution. In addition, MKIDs can be optimized for detection of photons ranging in energy from hard X-ray to IR.

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